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Intensive Water Quality Sampling Programs in North Central Texas (1977)

North Central Texas Council of Governments, Arlington

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Environmental Protection Agency, Dallas, Tex Region VI

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The document summarizes the objectives and outlines the methodologies of the several intensive water quality sampling programs being conducted as part of or in coordination with the Dallas/Fort Worth "208" areawide water quality management planning process. These include an in-depth field study of the impact of land use on Lake Ray Hubbard, Trinity River continuous automated monitors and water/sewage treatment plant sampling during storm events, river bottom sediment analysis, and several urban/nonurban runoff sampling activities. Contact persons for each program are also listed.

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TABLE OF CONTENTS

	Page
Introduction	1
Lake Ray Hubbard Study	2
Continuous Automated Monitors in River	4
Trinity River/Treatment Plant Sampling During Storms	6
Areawide Urban Stormwater Sampling	8
City of Dallas Urban Runoff Sampling Program	10
Areawide Nonurban Runoff Sampling	12
River Bottom Sediment Analysis	14
Literature Cited	15

1977 Intensive Water Quality Sampling Programs in North Central Texas

This document summarizes each of the intensive water quality sampling programs being conducted by the NCTCOG and participating local agencies. The sampling programs are designed to address specific data needs of the areawide planning process and utilize existing intensive and routine monitoring programs to the maximum extent possible. Existing and historical water quality data have been compiled and analyzed for NCTCOG by the Trinity River Authority in a separate document, "Gauging Our Water Quality."

This report has been prepared as part of the areawide water quality management planning process being conducted pursuant to requirements of Section 208 of the Federal Water Pollution Control Act Amendments of 1972 and was financed through a planning grant from the U.S. Environmental Protection Agency.

NORTH CENTRAL TEXAS COUNCIL OF GOVERNMENTS

March, 1977

INTRODUCTION

A thorough knowledge of water quality in our streams and reservoirs and factors which affect that quality is required in areawide planning. Because of the complex physicochemical and biological relationships occurring in the aquatic environment, direct and indirect measurements of various parameters are a necessity.

Data on recent and historical water quality,[1] treatment facilities,[2] and nonpoint sources of pollution[3] have been or are being assessed. These reports indicate several areas where further data beyond routine monitoring are needed to facilitate planning. Furthermore, the confidence in mathematical models is greatly enhanced where data are made available for their calibration.

The following sections of this report summarize the objectives and outline the methodologies of the several intensive sampling programs which are being conducted as part of or in coordination with the "208" areawide water quality management planning. These include an in-depth field study of the impact of land use on water quality in Lake Ray Hubbard, Trinity River continuous automated monitors and water/treatment plant sampling during storm events, river bottom sediment analysis, and several urban/nonurban runoff sampling activities.

A companion document, "Procedures for Sampling",[4] details sampling methodology, coordination, laboratory analyses, and data analyses of the NCTCOG programs. These sampling programs will fulfill several data requirements for the current areawide water quality planning and it is envisioned that additional sampling programs would be initiated under the continuing planning process.

LAKE RAY HUBBARD STUDY

OBJECTIVES:

This is an in-depth field study of the impact of land use on water quality in Lake Ray Hubbard, with emphasis on algal growth and its relationship to taste and odor problems. It should correlate introduced substances (i.e., nutrients) from the watershed with water quality in the lake, and provide information that will be useful in developing assessment programs for other water supply reservoirs in the region.

PROGRAM:

This 18-month quarter-million dollar intensive study is being conducted by the City of Dallas and the University of Texas at Dallas, and is being supported in part through an interagency contract with NCTCOG under the areawide planning process. Also, the TWQB is increasing the frequency of their routine monitoring and they will also perform certain special analyses involving sediments and algal growth potentials.

Sampling of in-lake water quality and of tributaries began in the spring of 1976, and is continuing through the fall of 1977 on a regular basis. A variety of physicochemical and biological components are measured including temperature, pH, light penetration, dissolved oxygen, nitrogen series, phosphorus series, selected metals, chlorophyll a, phytoplankton, and others. A computerized mathematical model is being refined to assist the investigations in predicting lake water quality as related to nutrient inputs.

Field results will be presented in a sampling Documentation Report, while the analytical techniques will be described in a Model Documentation Report. A Final Report will include detailed analysis of all data and model results with conclusions and recommendations.

FURTHER INFORMATION:

Contact Charles Bayer, Staff Biologist of NCTCOG at (817) 640-3300, or Bill Lewis of Dallas Water Utilities at (214) 748-9711, ext. 300.

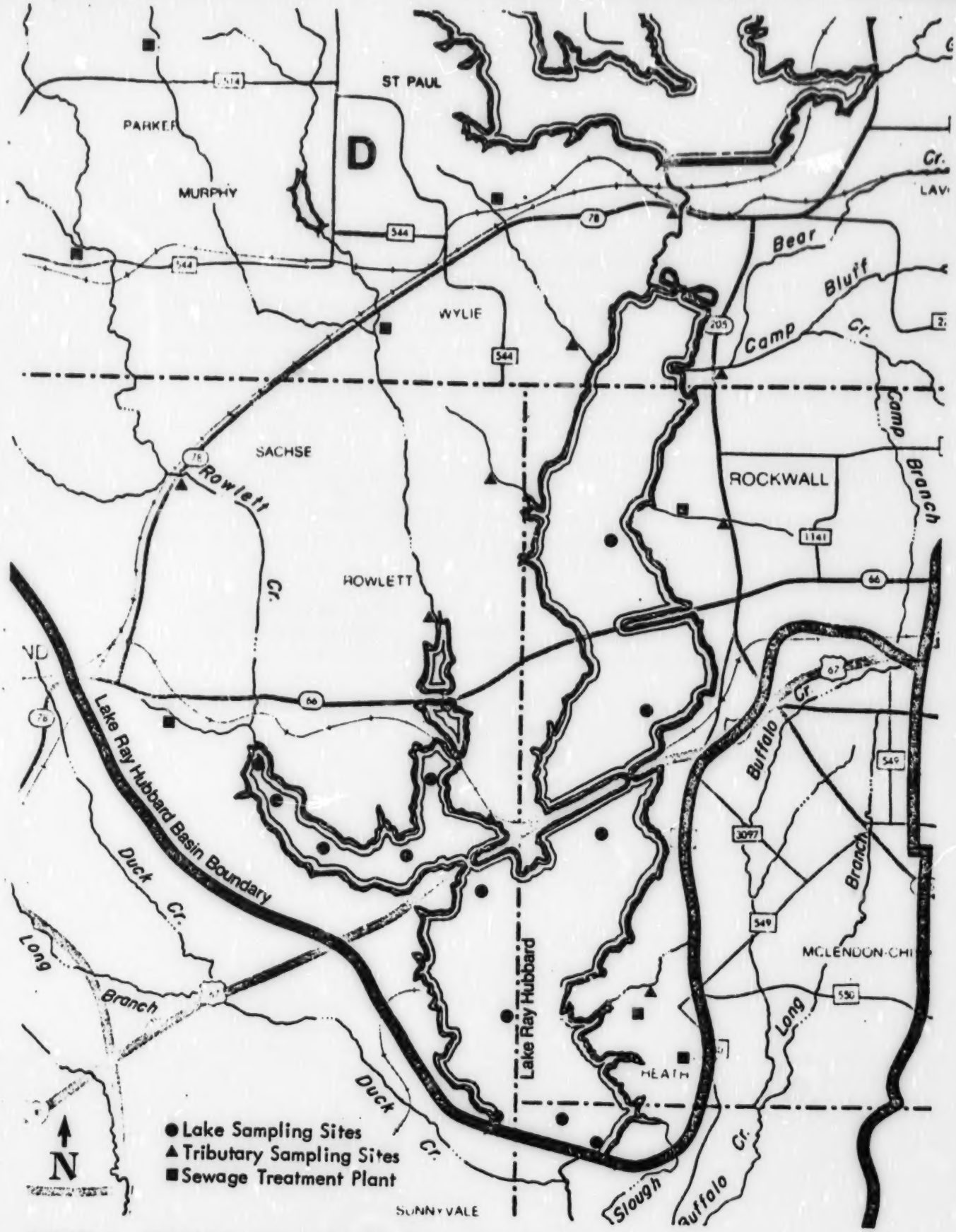


FIGURE 1 TRIBUTARY AND LAKE SAMPLING STATIONS.

CONTINUOUS AUTOMATED MONITORS IN RIVER

OBJECTIVES:

There are many reasons for continuous automated monitoring of the major streams - improving the description of the oxygen pollution problem during both dry and wet weather; documenting the before and after of the regional sewerage improvements program now under way; identifying changes in river quality between stations; providing essential data for the development of complex computer models of the river; and so forth.

PROGRAM:

Under a $110,000 cooperative agreement with NCTCOG, the U.S. Geological Survey is installing and maintaining sophisticated water quality sensors at each of the six sites along the Trinity River.

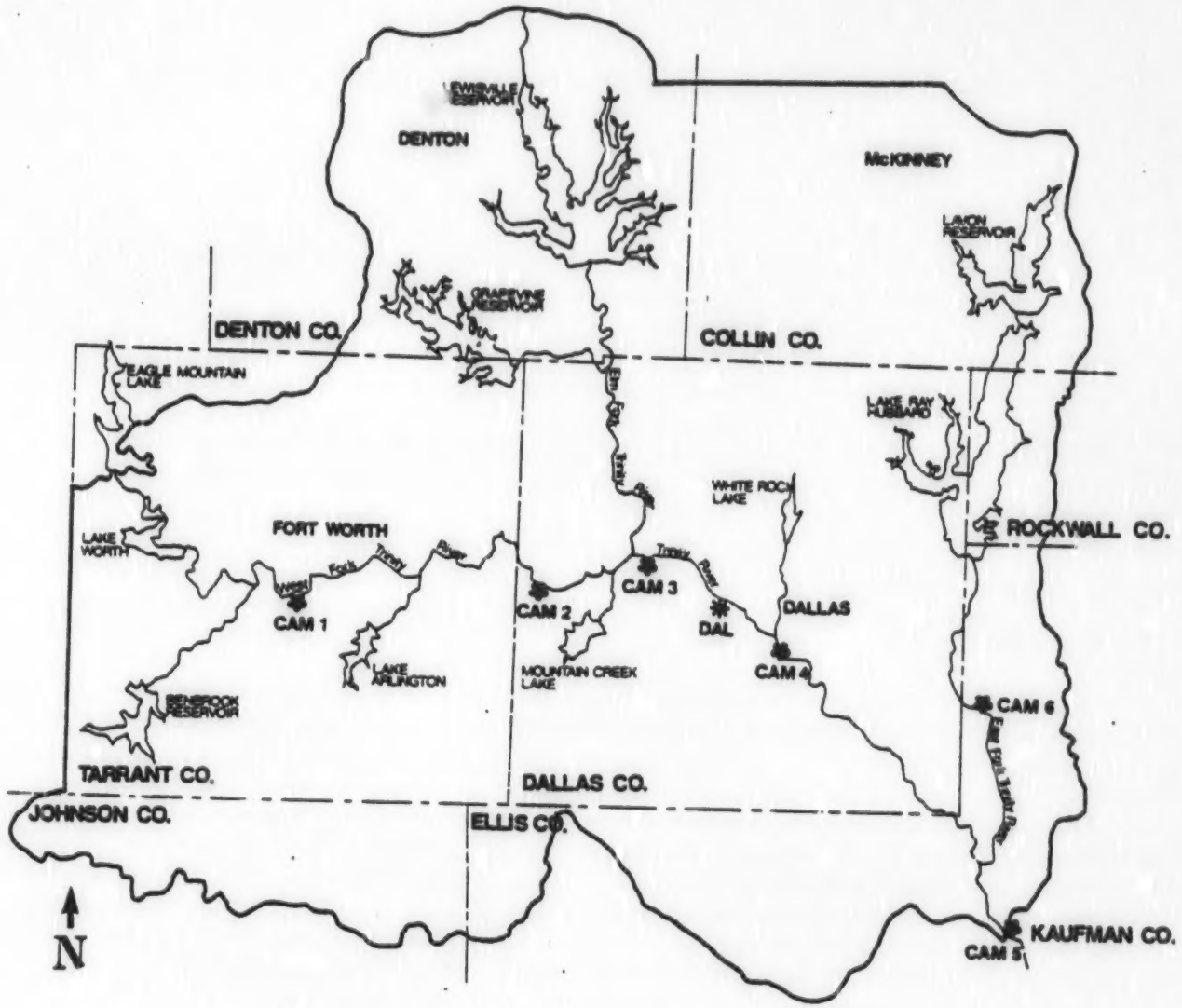
Every hour — day and night, rain or shine — the equipment takes a reading of the water quality condition for five water characteristics (dissolved oxygen, water temperature, pH, specific conductance, and flow).

This data is processed through computers and summarized for use by NCTCOG, local governments, water agencies and interested citizens as part of the areawide water quality management planning program.

The initial monitor (CAM 1) was installed in October, 1976, and all are to be operating by April, 1977. After June, 1977, the major water agencies are to pay the annual maintenance costs of the six monitors. In addition, the City of Dallas began operation of a continuous monitor (DAL) of its own in late 1976 (Figure 2).

FURTHER INFORMATION:

Contact Charles Bayer, Staff Biologist of NCTCOG at (817) 640-3300, or Gene Gann of the USGS at (817) 334-5551. A two-page description of the network is available from NCTCOG. Contact Bill Lewis, Dallas Water Utilities, for information on the Dallas continuous monitor (DAL), at (214) 748-9711, ext. 300.



MONITOR SITES:

CAM 1	West Fork Trinity River at Beach Street, Fort Worth
CAM 2	West Fork Trinity at W. Beltline, Grand Prairie
CAM 3	Trinity River at Westmoreland, Dallas
CAM 4	Trinity River at S. Loop 12, Dallas
CAM 5	Trinity River at S. H. 34, near Rosser
CAM 6	East Fork Trinity River at U. S. 175, near Crandall
DAL	Trinity River at Cedar Crest Blvd., Dallas

FIGURE 2 LOCATION OF CONTINUOUS AUTOMATED MONITORS.

TRINITY RIVER/SEWAGE TREATMENT PLANT SAMPLING DURING STORM

OBJECTIVES:

This sampling activity will supplement the continuous automated monitors during storm events by measuring treatment plant discharges and in-stream quality for a wide range of parameters. It should provide a more comprehensive assessment of the overall pollution problems of the Trinity River and allow the determination of aggregate non-treatment plant wet-weather loadings between sampling stations.

In addition, the eight (8) major sewage treatment plants in the area will be sampled during storm events to determine any quantitative and/or qualitative disparities in their effluents.

PROGRAM:

The sampling is being conducted by the Trinity River Authority and participating water agencies through an interagency contract with NCTCOG under the areawide planning process.

During a storm/runoff event, samples will be collected from six (6) mainstem Trinity River stations, eight (8) sewage treatment plants, and as many as seven (7) reservoir release sites (should releases be significantly increased) in an effort to (1) determine the overall severity of runoff-related pollution and (2) infer the amount of aggregate loadings between mainstem sampling sites. The data generated under this section will then be used in conjunction with the data produced under the Areawide Urban Stormwater Sampling program to more accurately define the types and relative amounts of runoff-related pollution one would expect from different land use types and/or weather conditions.

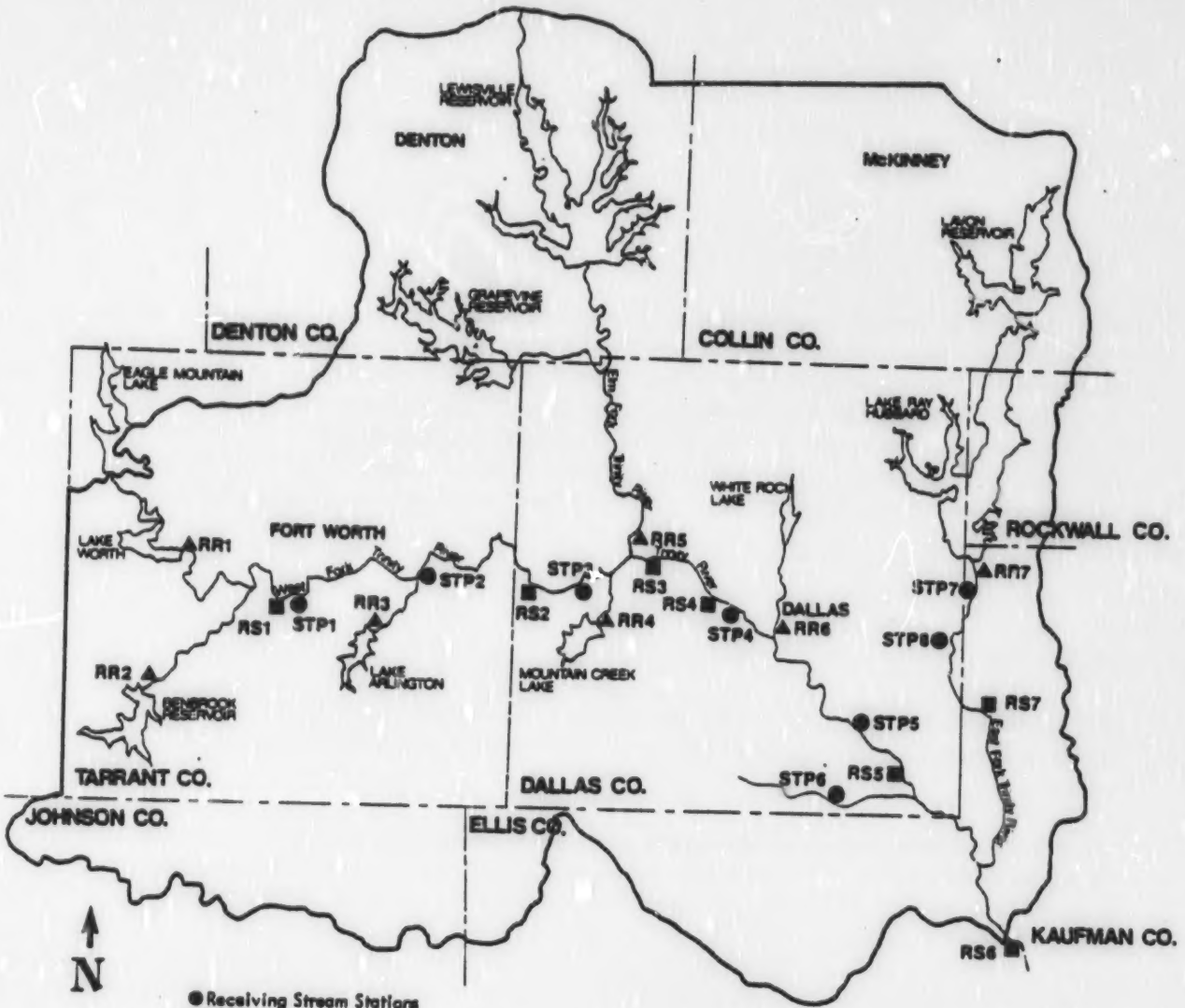
Parameters analyzed for are to include solids, various oxygen demands, nitrogen series, and phosphates, as well as several field measurements.

Sampling results will be presented in tabular and graphical form in a documentation report prepared by the TRA on a cumulative basis.

An intensive sampling effort for the East, West, and Elm Forks and the mainstem has been accomplished for low flow conditions for similar parameters as described in the "Water Quality Modelling Sampling Program."[5]

FURTHER INFORMATION:

Contact Charles Bayer, Staff Biologist of NCTCOG at (817) 640-3300 or K. C. Rudy of TRA at (817) 461-3151.



Receiving Stream Stations

RS1	West Fork Trinity River at Beach Street, Fort Worth
RS2	West Fork Trinity River at West Beltline, Grand Prairie
RS3	Trinity River at Westmoreland, Dallas
RS4	Trinity River at Cedar Crest Blvd., Dallas
RS5	Trinity River at Malloy Bridge, below Dallas
RS6	Trinity River at SH 34, near Rosser
RS7	East Fork Trinity River at U.S. 175, near Crandall

Reservoir Releases (if necessary)

RR1	Lake Worth
RR2	Lake Benbrook
RR3	Lake Arlington
RR4	Mountain Creek Lake
RR5	Elm Fork
RR6	White Rock Lake
RR7	Lake Ray Hubbard

Treatment Plant Stations

STP1	Riverside (Fort Worth)
STP2	Village Creek (Fort Worth)
STP3	Central (TRA)
STP4	Central - White Rock (Dallas)
STP5	Southside (Dallas)
STP6	Ten Mile Creek (TRA)
STP7	Duck Creek (Garland)
STP8	Mesquite (NTMWD)

FIGURE 3 SITES FOR THE TRINITY RIVER / SEWAGE TREATMENT PLANT SAMPLING.

AREAWIDE URBAN STORMWATER SAMPLING

OBJECTIVES:

This sampling effort will provide Dallas-Fort Worth area urban stormwater quality data to enable refinement of the national water quality data base related to urban stormwater phenomena. The sampling sites have been chosen to reflect different land uses and geographic locations and the constituent loadings will aid in comparison of constituent loadings generated by point discharges and other diffuse discharges in order to determine the relative amounts and impacts of pollution from these sources. Data from these surveys will also provide information for the calibration of computer models of stormwater runoff.

PROGRAM:

The sampling is being conducted by the Trinity River Authority and participating water agencies through an interagency contract with NCTCOG under the areawide planning process.

Sampling locations (Figure 4) have been selected for several predominant land uses throughout the study area as follows: three areas of single family residential; two areas within the central business district; one area each for heavy and light industry; and a commerical area.

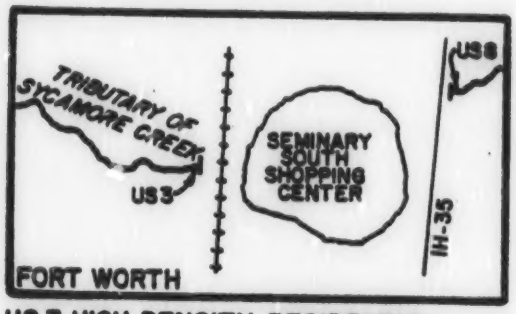
A variety of physicochemical and biological parameters including temperature, dissolved oxygen, carbonaceous oxygen demand, nitrogen series, phosphorus series, and dissolved and suspended solids will be measured at all stations for approximately eight discrete samples through the runoff event. At specified times and stations, the following parameters will also be measured: selected metals, selected pesticides and herbicides, and fecal coliform bacteria.

Two spring surveys are planned and will take place during storm runoff events. Additional urban sampling activities will be undertaken later in the year to investigate seasonal trends and special sites. A detailed "Procedures for Sampling"[4] document contains a list of each specific parameter, field sampling and laboratory analysis methods, sampling coordination procedures, and data analyses responsibility.

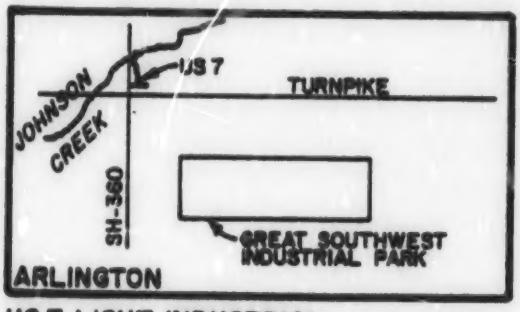
Sampling results will be presented in tabular and graphical form in a documentation report prepared by the TRA on a cumulative basis.

FURTHER INFORMATION:

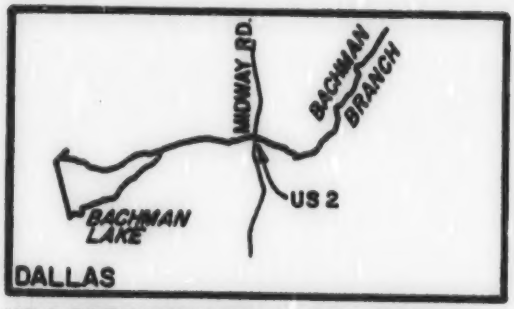
Contact Charles Bayer, Staff Biologist of NCTCOG at (817) 640-3300 or K. C. Rudy of TRA at (817) 461-3151.



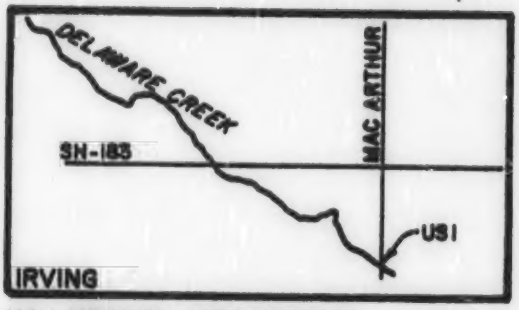
US 3 HIGH DENSITY RESIDENTIAL
US 8 COMMERCIAL



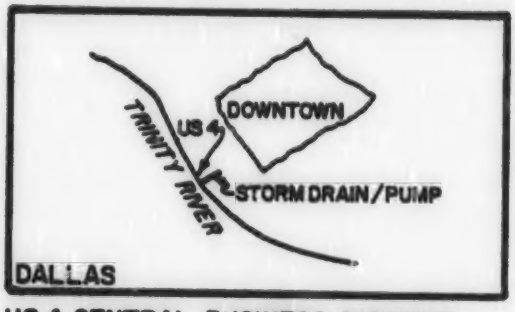
US 7 LIGHT INDUSTRIAL



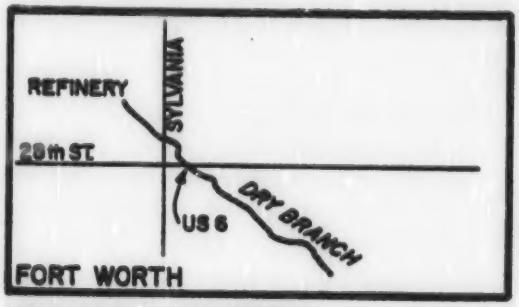
US 2 PREDOMINANTLY LOW DENSITY RESIDENTIAL



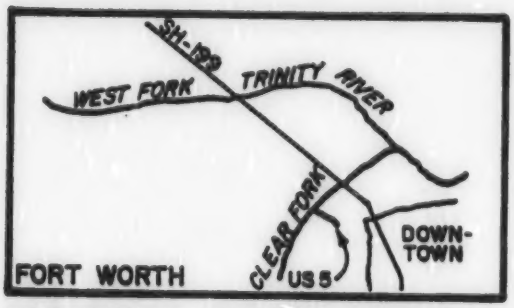
US 1 MEDIUM - HIGH DENSITY RESIDENTIAL



US 4 CENTRAL BUSINESS DISTRICT



US 6 HEAVY INDUSTRIAL



US 5 CENTRAL BUSINESS DISTRICT

FIGURE 4. SITES FOR URBAN STORMWATER SAMPLING

CITY OF DALLAS

URBAN RUNOFF SAMPLING PROGRAM[6]

OBJECTIVES:

The Urban Runoff Sampling Program is intended to provide data that will enable the involved City of Dallas departments to identify the quantity and quality of water entering the Trinity River and its various tributaries during periods of rainfall and runoff.

PROGRAM:

In 1975, the Dallas Water Utilities (DWU) department undertook a runoff sampling program at eight locations within its municipal boundaries. A dry weather baseline sample run was made on March 18, 1975, and a wet weather sample run on November 2, 1975.

In February, 1976, the runoff sampling program was expanded from eight to seventeen sampling points, and the Environmental Health and Conservation Department and the Storm Drainage Division of the Public Works Department were added as participating agencies with the DWU. Sampling runs were made in May of 1976 and February of 1977.

The sampling stations are of three distinct types: five are in the main stem of the Trinity, six are on tributaries, and six are on major storm drains. Actual sampling runs are anticipated three to five times in the first two years and less frequently after a reasonably reliable data base has been established. In each sampling run, up to six sample sets are to be collected for each sample point to give a representative idea of the quality of water at various stages of flow.

A wide variety of physiocochemical parameters are measured including temperature, dissolved oxygen, carbonaceous oxygen demand, nitrogen series, phosphorus series, and selected metals and pesticides. Printed sample data is prepared by DWU Operations Analysis Division.

FURTHER INFORMATION:

Contact Dan Brock of Dallas Water Utilities at (214) 748-9711, ext. 356.

TABLE 1. LOCATION OF THE CITY OF DALLAS URBAN RUNOFF SAMPLING STATIONS

URS 1	West Fork of Trinity at Walton Walker
URS 2	Elm Fork of Trinity at California Crossing
URS 3	Trinity River at Cedar Crest (Forest Avenue)
URS 4	Trinity River at Highway 75 (South Central Expressway)
URS 5	Trinity River at South Loop 12 (Ledbetter)
URS 6	Joes Creek at Willowbrook
URS 7	Bachman Creek at Midway Road
URS 8	Turtle Creek at Hall Street
URS 9	White Rock Creek at Greenville Avenue
URS 10	White Rock Creek at Scyene Road
URS 11	Five Mile Creek at Lancaster Road
URS 12	Pump Station A (Industrial at Tollway, northeast of Trinity)
URS 13	Pump Station B (Industrial at Motor Street, northeast of Trinity)
URS 14	Pump Station C (Colorado at Levee, southwest of Trinity)
URS 15	Pump Station D (Westmoreland at Levee, southwest of Trinity)
URS 16	Bellview Pressure Sewer – sample upstream of outfall
URS 17	Lake Cliff Pressure Sewer – sample at lake

AREAWIDE NONURBAN RUNOFF SAMPLING

OBJECTIVES:

This sampling effort will provide Dallas-Fort Worth area runoff water quality data to enable refinement of the national water quality data base related to runoff phenomena. The sampling sites will be selected to reflect different soil characteristics, agricultural practices, natural or "background" conditions, construction and mining activities, and septic tank areas and solid waste sites. The constituent loads generated with the aid of these data will be compared with constituent loadings from point discharges and urban stormwater such that the relative amounts and impacts of pollution from these sources can be determined. Where applicable, data from these surveys will provide information for the calibration of computer models.

PROGRAM:

The sampling is being conducted by the Trinity River Authority and participating water agencies through an interagency contract under the areawide planning process.

Agricultural and natural locations will be selected to compare the Blackland Prairie with the Cross Timbers and Grand Prairie and also to characterize pasture lands, rangelands, and several types of croplands as reflected in Figure 6. Sites will also be selected, if possible, to characterize residential and highway construction, resource extraction, and septic tank and solid waste disposal areas.

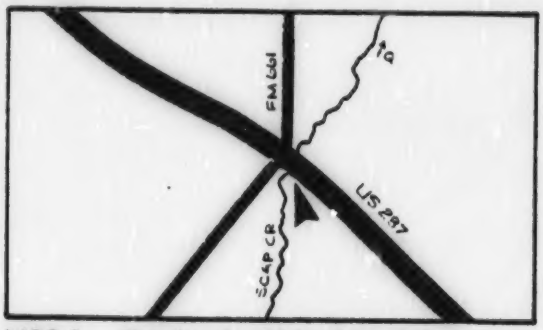
Some of the physicochemical parameters to be measured are temperature, dissolved oxygen, carbonaceous oxygen demand, nitrogen series, phosphorus series, dissolved and suspended solids, selected metals, and selected herbicides and pesticides. Approximately eight discrete samples will be analyzed at each station through the runoff event.

One spring survey is planned for a storm runoff event for approximately 12 sites from the previously mentioned categories. Additional sampling activities may be undertaken later in the year to investigate seasonal trends and special sites. These activities will be coordinated with the Lake Ray Hubbard eutrophication study.

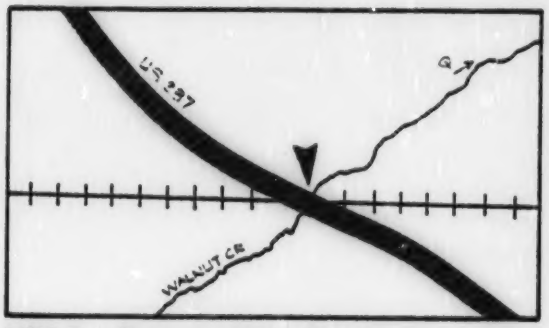
Sampling results will be presented in tabular and graphical form in a documentation report prepared by the TRA on a cumulative basis.

FURTHER INFORMATION:

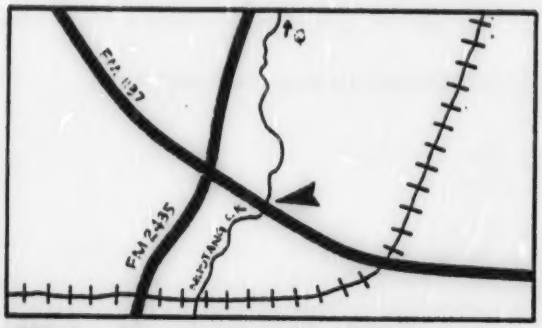
Contact Charles Bayer, Staff Biologist of NCTCOG at (817) 640-3300 or K. C. Rudy of TRA at (817) 461-3151.



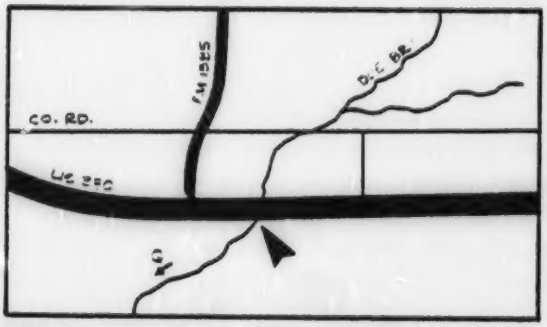
NRS 1. Cropland within East Cross Timbers and Grand Prairie.



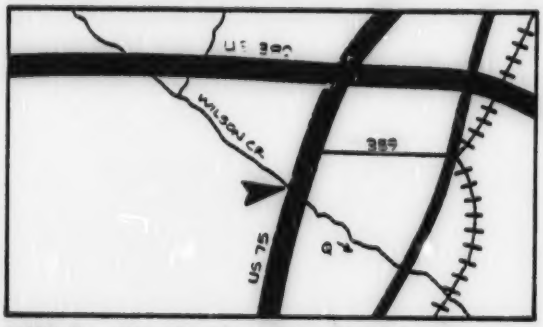
NRS 2. Pasture within East Cross Timbers and Grand Prairie.



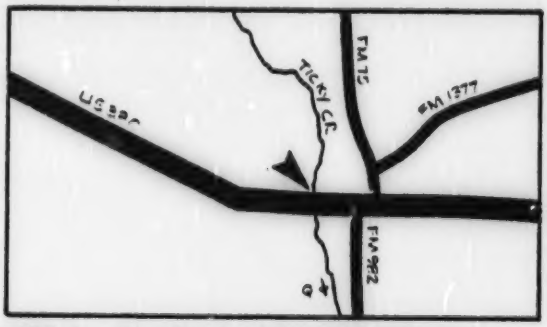
NRS 3. Rangeland within East Cross Timbers and Grand Prairie.



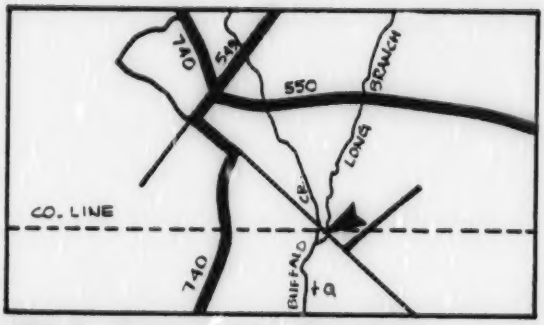
NRS 4. Cropland within Blackland Prairie.



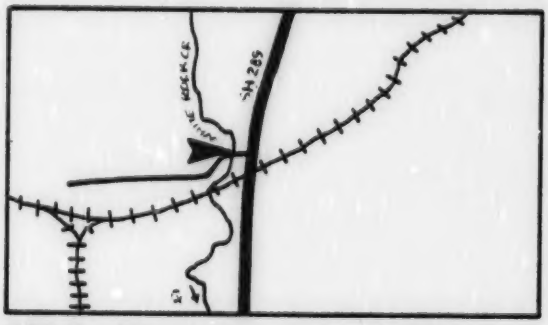
NRS 5. Cropland within Blackland Prairie.



NRS 6. Cropland within Blackland Prairie.



NRS 7. Pasture within Blackland Prairie.



NRS 8. Mixed urban and agriculture within Blackland Prairie.

FIGURE 5 LOCATION OF NONURBAN RUNOFF SAMPLING STATIONS.

RIVER BOTTOM SEDIMENT ANALYSIS

OBJECTIVES:

The sampling of bottom sediments will be directed at determining the sedimentation rate, analyzing sediment quality, and studying the resuspension phenomenon in the river.

PROGRAM:

Sediment sampling is being conducted by the Trinity River Authority under an inter-agency contract under the areawide planning process.

Sampling locations (to be specifically determined in mid-1977) will be chosen to portray overall sediment quality in the Trinity River, as well as identify significant sinks of nutrients and other oxygen-demanding materials. In addition special samplers will be left in the river at selected sites to determine sedimentation rates.

Parameters to be measured will include the nitrogen series, total phosphorus, ortho-phosphorus, oil and grease, various oxygen demands, and selected metals and pesticides.

Sampling will be conducted during dry weather, low flow conditions. This will more than likely occur during the summer months.

Sampling results will be worked up in a concise form and included in a documentation report prepared by the TRA on a cumulative basis.

FURTHER INFORMATION:

Contact Charles Bayer, Staff Biologist of NCTCOG at (817) 640-3300 or Dr. Richard Browning or K. C. Rudy of TRA at (817) 461-3151.

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